

Two shipwreck survivors manage to swim to a desert island. As it happens, the shape of the island is a perfect equilateral triangle. The survivors have very different dispositions. Sarah soon discovers that the surfing is outstanding on all three of the island's coasts, so she crafts a surfboard from a fallen tree. Because there is plenty of food on the island, she's content to stay on the island and surf for the rest of her days. Spencer, on the other hand, is more a social animal and sorely misses civilization. Every day he goes to a different corner of the island and searches the waters for passing ships. Each castaway wants to locate a home in the place that best suits his or her needs. They have no interest in living in the same place, though if it turns out to be advantageous, neither is against the idea. Sarah wants to visit each beach with equal frequency, so she wants to find the spot that minimizes the total length of the three paths from home to the three sides of the island. Spencer wants his house to be situated so that the total length of the three paths from his home to the three corners of the island is minimized. Where should they locate their huts?

SKETCH AND INVESTIGATE

Use a custom tool or construct the triangle from scratch.

Select point E and the three sides. Then, in the Construct menu, choose **Perpendicular Lines**. You'll get all three perpendicular lines.

Choose **Calculate** from the Number menu to open the **Calculator**. Click a measurement to enter it into a calculation.

1. Construct an equilateral triangle ABC .
 2. Construct \overline{DA} , \overline{DB} , and \overline{DC} , where D is any point inside the triangle. Point D represents Spencer's hut and the segments represent paths to the corners of the island.
 3. Construct point E anywhere inside the triangle.
 4. Construct lines through point E perpendicular to each of the three sides of the triangle.
 5. Construct \overline{EF} , \overline{EG} , and \overline{EH} , where F , G , and H are the points where the perpendiculars intersect the sides of the triangle.
 6. Hide the perpendicular lines. Point E represents Sarah's hut and the segments from it represent the paths from her hut to the beaches.
 7. Measure DA , DB , and DC and calculate $DA + DB + DC$.
 8. Measure EF , EG , and EH and calculate $EF + EG + EH$.
 9. Move points D and E (Spencer and Sarah) around inside your triangle. See if you can find the best location for each castaway.
- Q1** What are the best locations for Spencer's and Sarah's huts? Explain why these are the best locations.

